## OFFICE OF MANNED SPACE FLIGHT

## **APOLLO PROGRAM**

# WEIGHT/PERFORMANCE MANAGEMENT SURVEY MANUAL

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## PREPARED BY APOLLO PROGRAM OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

## WEIGHT/PERFORMANCE MANAGEMENT SURVEY MANUAL

August 15, 1965

Performance Analysis and Control Apollo Program Office National Aeronautics and Space Administration Washington, D.C. 20546

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#### Abstract

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The Weight/Performance Management Survey Manual provides procedures for a management audit of NASA Apollo Program contractor activities, assesses performance towards objectives, evaluates effectiveness of the management system, and where weaknesses exist, it provides a tool for determining corrective action. This amplifies Mass Properties Standard NASA SP-6004, June 1965.

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#### INTRODUCTION

To assure effective planning, optimization, and control of the Apollo Space Vehicle weight and performance management program, it is imperative that each center, contractor, and sub-contractor develop and maintain efficient mass properties control systems. Confidence in the effectiveness of the weight and performance management program can only be assured by the qualitative evaluation of the adequacy of the established mass properties systems. Such evaluations, to be practical and worthwhile, must include the necessary elements of planning, conducting, reporting, and follow-up.

This manual is presented as an aid in meeting the requirements of those NASA managers concerned with functions related to mass properties control, and as such provides guidance, procedures, instructions, and work sheets for surveillance as well as more thorough periodic management surveys.

This manual was prepared by the Performance Analysis and Control Office (Code MAP-2) of the Apollo Program Office, NASA, Washington, D.C.

The techniques developed herein can readily be converted to meet evaluation requirements in other areas. Electrical power management, thermal control and vibration, shock, and acoustics are typical examples.

#### WHY THIS EFFORT?

In the interest of attaining true program mass properties control; this formal management survey provides an audit of NASA and contractor activities, assesses performance toward objectives, evaluates effectiveness of relationship between participating organizations, and where problems exist, provides a tool for determining corrective action.

Prior to assessing a mass properties control system it is necessary to specify:

#### Objectives

The results of the management survey must provide a full measure of current and projected status, identify weaknesses, and establish remedial actions.

#### **Policies**

Basic ground rules or guides must provide assurance that desired goals and objectives will be attained.

#### Plans

It is necessary to transform the objectives and policies into a systematic working document which delineates a realistic schedule of survey events, identifies areas of concern, and establishes a technical and administrative approach.

#### Standards of Measurable Performance

The results of the survey must be expressed in readily recognizable quantitative terms, preferably a proficiency rating (PR).

#### UTILIZING THE RESULTS

The survey will provide results which define the administrative as well as the engineering deficiencies. Accordingly, cognizant NASA managers will obtain valuable insight into existing and probable contractor weaknesses; and will be in a better position to take actions essential to the solution of weight and performance control problems.

The ultimate worth of the obtained results will be a direct function of the effort extended by the survey team in planning and executing its assigned task.

#### **OBJECTIVES**

Six areas of concern must be investigated to ascertain mass property control system status, weaknesses, and desired remedial actions. They are:

- a. Planning: Recognition and proper phasing of each and every action necessary to attain mass properties objectives.
- b. Communications: Policies and procedures (instructions, work orders, information flow system, etc.) defining authorities and responsibilities sufficiently to direct, control, conduct, and administer the mass properties control system.
- c. Disciplines: Adequacy of managerial discipline and organization in requiring compliance with plans, policies, and procedures necessary to attain mass properties control objectives.
- d. Training and Education: Sufficiency of details of who, why, what, when, where, and how of mass property control system provided to responsible personnel at all levels.
- e. Judgments: Soundness, prudence, and practicality of decisions made in carrying out the mass property control system plans, policies, procedures, information flow, and technical aspects.
- f. Technical knowledge and ability to perform engineering functions, including mass property analyses and evaluations of vehicle performance, in compliance with specifications and standards.

These areas of concern can be measured quantitatively through an analysis, based on a series of evaluation questions, resulting in an overall "Proficiency Rating." This is covered in detail in the "Standards of Measurable Performance" section.

#### **POLICIES**

#### Technical Approach

The evaluations will be accomplished by a team of responsible representatives of cognizant center engineering groups, and supported by the MSF/Apollo Program Office in the role of amicus curiae. The evaluation consists of nine steps, starting with the

selection of the team, and ending with the final report containing the results of all action items.

#### Team Function

Each team member will be assigned primary and secondary areas of responsibility. He will, at the conclusion of the evaluation, prepare an informal report for the chairman, covering his primary area of responsibility, and critique the report covering his secondary area of responsibility. The final report is prepared by the chairman, and critiqued by the team members. The chairman is also responsible for scheduling the events and meetings required for the evaluation, and for making necessary arrangements with the contractor.

#### **Prerequisites**

The evaluation of any area of a contract is a task which must, once the decision is made to proceed, be accomplished with a minimum perturbation to the contractor's effort. The evaluation team, to properly discharge its responsibilities, must be fully and completely prepared for the task; therefore, the prerequisites are an essential part of the evaluation. How the evaluation goes, and how successful the team is, will depend entirely on how well they are prepared.

#### Modus Operandi

The evaluation shall be conducted in nine basic steps, starting with the selection of the team members and ending with the submittal of the final report. Therefore, adherence to the basic procedures is strongly recommended for consistency and assistance in the required follow-on actions.

The prerequisites, agenda, and work sheets presented should be critiqued and amended for applicability to the particular contract being evaluated. The relative importance of the six areas (noted under objectives) should be established and noted on the work sheets of Table I prior to the evaluation.

#### End Item Reports

An objective summary of the evaluation, emphasizing the areas of concern, will be prepared for management immediately following the evaluation. This summary will, in addition to reviewing the actual evaluation, contain a complete listing of all incomplete action items, with a schedule for resolution. A complete report will follow the summary after all action items are complete, and will contain additional recommendations and a follow-up schedule.

#### Follow-up

Follow-up evaluations should be conducted by the same team, whenever possible, to determine the effectiveness of the recommendations and action items, and to provide continuous surveillance of the program.

#### PLANS

#### Team Selection (step one)

It is desirable to utilize a small group of competent individuals with the team chairman from the cognizant project or chief engineer's office. Suggested areas of team specialist representation and responsibility are:

- A. Weight Control
- B. Mass Measurement (facilities, propellant loading, etc.)
- C. Systems Engineering
- D. Contracts
- E. Project Office

#### Initial Meeting (step two)

An initial meeting of the team is required to:

- A. Explain the objectives of the evaluation, and the responsibilities of team members.
  - B. Make assignments of primary and secondary areas of responsibility.
- C. Establish a schedule of events for the evaluation. (This will provide each team member with the relationship of his inputs to those of the other team members.)
  - D. Prepare a preliminary agenda for the meeting with the contractor.

#### Team Actions (step three)

In accordance with the developed schedule it is necessary to assure that: (1) sufficient background data will be available for the team members to prepare for the visit to the contractor's facility, and (2) the contractor will have sufficient time to respond to the notice of evaluation. To accomplish these objectives adequately, the following items should be considered:

- I. The chairman informs the contractor, through official channels, of the evaluation, including objectives and expected cooperation. Notification will include:
- A. Definite date of team visit to contractor's facility in accordance with the developed schedule.
- B. A preliminary agenda, with a request for additional items that the contractor considers relevant to such an evaluation, and schedule for submittal.
- II. The chairman prepares, and distributes to the team members, a preliminary outline of the final report. See Table III for sample outline.

#### III. Team members compile:

- A. Background data in support of the survey agenda and final report.
- 1. CONTRACT REQUIREMENTS Exact requirements imposed on the contractor and delineation of information of informal or working agreements; control requirements imposed on the contractor (e.g., NASA SP-6004, Mass Properties Standard, or equivalent); submittal requirements and specification requirements.

#### 2. RESPONSE TO REQUIREMENTS

- a. Evaluation of submittals (Should include completeness, validity, and timeliness of submitted data.)
- b. Supplemental data—Does the contractor respond to requests for supplemental data?

#### 3. COMPARATIVE DATA

- a. Trend relationship between contractor—submitted data and contractual requirements.
  - b. Compatibility of measured data with calculated and estimated data.

#### 4. PROBLEM AREAS

- a. Current, past, and possible future problems based on center/contractor relationships to date.
  - b. Remedial actions and their effectiveness in solution of prior problems.
- B. Detail outline of informal report of assigned area of responsibility in accordance with the preliminary final report outline, noted in II above.

#### IV. Agenda

The chairman prepares final agenda, with supporting checklist, considering contractor's response to request for additional items.

#### A. Purpose

1. The agenda shall cover the steps which are necessary to obtain and substantiate the answers to questions covering all classifications in the Qualitative Evaluation Sheets.

#### B. Recommended Basic Agenda

#### 1. SESSION I

#### a. Attendees

- (1) NASA personnel
- (2) Contractor personnel

#### b. Purpose

- (1) Chairman will discuss agenda items, purpose of evaluation, and anticipated results.
- (2) Contractor personnel will present to NASA the material which they have prepared to assist in the survey.

#### 2. SESSION II

#### a. Attendees

(1) Session II will consist of separate simultaneous sessions of NASA personnel responsible for each Classification, meeting with contractor personnel cognizant in each Classification.

#### b. Purpose

- (1) Discuss in detail each Classification of Weight/Performance Management. Obtain answers to all questions in Qualitative Evaluation Sheet for each Classification.
- (2) Examine substantiating evidence for answers to questions, where applicable, (i.e., records of deliveries and documentation submittals, test equipment calibration records, substantiation of vendor and subcontractor weight/performance management sufficiency, etc.)

#### 3. SESSION III

#### a. Attendees

- (1) All personnel present at Session I.
- (2) Any additional personnel as determined to be necessary to meet the purpose of Session  $\Pi I$ .

#### b. Purpose

- (1) Clear up any questions remaining unanswered by Session II, particularly in areas involving interfaces among Classifications. (May include additional presentations, therefore a time allocation should be made to cover this contingency.)
- (2) Resolve any conflicts between question answers and substantiating evidence.
- (3) Assign Action Items to contractor by NASA where necessary to substantiate or clear up any items as required to meet all requirements of the survey.
  - (4) Summation of survey activities.

V. Final agenda is provided to team members and contractor.

#### Team Meeting (step four)

- A. Review by the chairman of the objectives, responsibilities, and assignments.
- B. Review the agenda, and make any adjustments required as a result of investigations made in the development of the background data, and contractor's response to notification of evaluation.
- C. Background data distributed to team, accompanied by any discussion necessary for clarity and understanding by the team members.

#### Initial Meeting with Contractor (step five)

- A. Chairman discusses purpose and scope of survey (Session I of agenda).
- B. The contractor makes his presentation in accordance with the requirements of Session I of the agenda.
- C. Team specialists hold "depth interviews" (Session II of agenda) with contractor representatives.

#### Team Meeting (step six - Held immediately following Session II of agenda.)

- A. Review of findings, with a determination of:
  - 1. Items not covered.
  - 2. Items covered, but not to the satisfaction of team specialists.
  - 3. New items, resulting from initial meeting with contractor.
- B. Notification to contractor of:
  - 1. Additional presentations required.
  - 2. "Depth interviews" with specific individuals or groups required.
- C. Identification of all action items with assignment of responsibility for resolution and/or recommendations.

#### Final Meeting with Contractor (step seven)

- A. Additional presentations and/or "depth interviews" with cognizant contractor representatives. (First item of Session III of agenda.)
- B. Assignment of action items, includes identification and scope of contractor or customer responsibility, and determination of schedule for a resolution or recommendation.

#### Team Actions (step eight — upon return to NASA installation)

A. Resolution and/or recommendation of action items assigned.

- B. Draft of assigned informal report.
- C. Critique draft of secondary assignment.
- D. Submit any recommendations and/or comments relative to the evaluation.

#### Completion of Assignment (step nine)

- A. Chairman completes and edits final draft of report and summary of open items.
- B. Report submitted to distribution.

#### STANDARDS OF MEASURABLE PERFORMANCE

#### The Proficiency Rating

Placing a "Proficiency Rating" (PR) upon an organization and its mass property control system requires a quantitative approach. To do this a set of 99 basic evaluation questions, Table I, have been assembled. These questions when answered and rated, result in both an administrative and an engineering PR rating. The administrative PR rating provides a measure of the contractor's planning, communications, discipline, training and education, judgment, and technical know-how. The engineering PR rating provides a measure of engineering management with respect to:

- 1. Preparedness and Attitudes
- 2. Formulation of Requirements
- 3. Formulation of the Mass Properties Control System
- 4. Mass Properties Analysis
- 5. Design Monitoring
- 6. Subcontractor and Vendor Surveillance
- 7. Measured Data
- 8. Mass Properties and Performance Assurance
- 9. Submittals

The results of the administrative and engineering evaluation allows the survey team to pinpoint weaknesses. It is through this media then, that NASA management can make constructive recommendations to the contractor. Additionally, the survey points out to NASA where contractual action should be taken to effectively resolve critical conditions.

#### The Evaluation Technique

The evaluation is relatively straight-forward in that the previously noted questions are

used to determine the depth and scope of the contractor's mass property control effort. The survey team may augment the basic questions with leading inquiries of greater detail, but the ultimate goal should always be to obtain responses to the basic question. Detailed probing will allow the team to rate the contractor's basic response in a more efficient manner. A word of caution is in order, however, since too many detail questions will only serve to cloud the issue.

#### Rating the Answers (see Table I)

To the right of each question there is a block similar to the one shown here. This is the answer rating block.

+ Y	-	+	N	-
-----	---	---	---	---

Since all basic questions require only a yes or no answer, the survey team's task becomes one of determining the quantitative worth of the yes or no response. This is accomplished by utilizing lead questions as previously noted and interpreting the answers quantitatively by rating them to the plus, middle, or negative side of yes (Y) or no (N). The survey team may circle one of the individual blocks during the course of the interview once the question is answered. For example:

	+	Y	(F)	+	N	-
--	---	---	-----	---	---	---

After the survey is completed the circled answers are rated numerically as follows:

10	8	6	4	2	0
+	Y	-	+	N	-

For example, a negative yes is evaluated as six. A negative no is worth zero. The numerical value should be placed next to the circled block but only when the survey is completed. The maximum worth of any classification is ten times the number of questions. Therefore, if there are four questions the rating could vary between zero and forty, and is accomplished by adding the individual question ratings. The rating given to each classification is entered on the Proficiency Rating Form, Table II. Summing the individual totals and dividing by 990 results in an overall PR rating and completes the quantitative rating. The higher the PR the more adequate the contractor's mass properties control effort. The highest or best rating is 100 percent.

#### A Final Word

The proficiency rating so obtained is regarded as a sound measure of the depth and scope of the contractor's effort. However, there are times when a critical situation may exist and be so detrimental to project and program objectives that the proficiency rating cannot accentuate it adequately. For example, if a contractor is not submitting data (i.e., none at all) in accordance with NASA requirements, a special condition exists and warrants a special report which should immediately be brought to the attention of cognizant parties for corrective action. In essence, a contractor's effort may be efficient and expeditious but NASA cannot determine this unless it receives a tangible end product, namely the required submittals.

TABLE I

**Evaluation Questions** 

QUA	LITATIVE EVALUATION NO	DATE				_
CEN	ITER	CONTRACTOR			·	
CON	TRACT NO	STAGE/MODULE				
RAT	TING OFFICIAL	Name and Title				
Clas	ssification: 1. PREPAREDNESS	AND ATTITUDES				
Obje	ective: To review the contractor' (These questions should b	s overall responsiveness e answered after the survey.)				
а.	Planning (1) Was the contractor adequate in accordance with the NASA	•	+ Y	- [ + ]	N	=]
b.	Communications (1) Were contractor position and responses to NASA questions ment and engineering levels	s consistent at all manage-	+ Y	- +	N	-
c.	Disciplines (1) Did the contractor support to assuring the availability of conswer inquiries or to acquition?	cognizant personnel to	+ Y	- +	N	-
d.	Training and Education (1) Was there an awareness at a neering levels of the import properties control?		+ Y	- +	N	
e.	Judgments (1) Were the responses to the m straightforward and sound relittle foundation?		+ Y	- +	N	
f.	Technical (1) Was the contractor's preparaspects of the survey eviden and/or contractor prepared	t in detail discussions	+ Y	- +	N	-

QUALI	TATIVE EVALUATION NO	DATE	
CENTI	ERC	ONTRACTOR	
CONTI	RACT NOSTA	GE/MODULE	
RATIN	G OFFICIALNa	ame and Title	<u> </u>
Classii	fication: 2. FORMULATION OF REQUIF	REMENTS	
Object	ive: To determine the existence of requi procedures, and documentation esse effective mass properties control.		
a. Pl	anning  Are mass properties requirements tra through all levels of contractor and rel documentation? (This includes contrac standards, specifications, and substan reports as applicable to contractors, s contractors, vendors, and government equipment.)	ated NASA ets, tiating sub-	+ Y - + N -
b. Co	ommunications	nsmitted	+ Y - + N -
c. Di	sciplines	revisions	+ Y - + N -
d. Tr	raining and Education  Does the contractor have documented pand guidelines for implementing and man effective mass properties control page 2.	aintaining	+ Y - + N -
e. Ju	dgments  Are the contractor's interpretations of requirements consistent with a government of the properties Standard (NASA SP-6004 or properties STANDARD (NAS	ing Mass	+ Y - + N -
f. Te	echnical  Does the contractor have documented a and evaluations which substantiate exist requirements?		+ Y - + N -

QUA	LIT	ATIVE EVALUATION NO	DATE	
CEN	(TE	R	CONTRACTOR	
CON	ITR	ACT NO	_STAGE/MODULE	
RAT	ring	OFFICIAL	Name and Title	
Clas	ssifi	cation: 3. FORMULATION OF T	HE MASS PROPERTIE	S CONTROL SYSTEM
<u>Obj</u> e	ectiv	re: To establish the depth and soon ning, organization, and contrecties system.	-	
a.		nning  Does the contractor have a planne event and milestone schedule) m		+ Y - + N -
	(2)	control program?  Does the plan provide for studying documenting, reporting, and comproperties?		+ Y - + N -
	(3)	Does the plan provide for automator (or other acceptable accounting drawing sign-offs, mass measurements)	procedures),	+ Y - + N -
	(4)	contractor and vendor surveillar Does the plan provide for the es control of changes to requireme specification weights, center of etc.)?	tablishment and nts (i.e.,	+ Y - + N -
b.		nmunications Is the contractor's mass proper distribution for all documentation to or affecting mass properties	n pertaining	+ Y - + N -
	(2)	Do key mass properties member participate in cyclic meetings of committees, change control boa project staff?	rs actively Edesign review	+ Y - + N -
	(3)		es status , and all	+ Y - + N -
c.	Dis (1)	ciplines  Does the project mass propertie  have full responsibility for the r	<u> </u>	+ Y - + N -

the mass properties control program (i.e., no split responsibilities with staff groups)? (2) Is the identity and management level of the contractor's Y mass properties control group easily determined from organizational charts (i.e., no integration of mass property group elements with other functional areas)? (3) Is the mass properties group adequately staffed and Y N organized (i.e., accounting, weight control and analysis, mass measurement, and administrative elements) to effectively accomplish the mass properties control program? (4) Does the manager of the mass properties group have Y access to top management to make recommendations and obtain decisions on mass property problems? Training and Education (1) Does the mass properties control group actively Y (i.e., through posters, charts, brochures, handbooks, and/or classroom instructions) provide the who, what, why, and methods of weight control to functional design elements as well as the appropriate project management elements? (2) Is the training and education program to be maintained Y N on a continuous basis throughout the lifetime of the project? Judgments Y (1) Are the decisions which involve mass properties made within the framework of performance, cost, schedule, and reliability trade-off effects? (A positive answer should be supported by actual documentation.) (2) Are management decisions affecting mass properties Ν agreed to by cognizant mass property personnel? Technical Y

#### f.

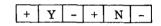
d.

- (1) Is the contractor's mass properties control program effective through the conceptual, definition, design, test, and checkout phases and in compliance with NASA approved standards and/or specifications?
- (2) Does the mass properties group have cognizance over (or access to) weight and performance trade-off assessments, and corresponding mass property evaluations?

QU <i>I</i>	ALITATIVE EVALUATION NO	DATE	·
CEI	NTER	CONTRACTOR	
COI	NTRACT NO	STAGE/MODULE	
RAT	ring official	Name and Title	
Cla	ssification: 4. MASS PROPERT	TIES ANALYSIS	
<u>Obj</u>	ective: To determine the extent performed design optiming requirement analyses as properties.		
a.	Planning (1) Is there an overall project provides for continuous desoptimize weight and perfor ware problems under continuous are they solved only when the	sign assessments to mance (i.e., are hard- nuous assessment or	+ Y - + N -
b.	Communications (1) Does the mass properties a inputs to design review, che project staff meetings?	ange control, and	+ Y - + N -
	(2) Is the mass properties gro of the results of such meet effective follow-up actions	ings to implement	+ Y - + N -
c.	Disciplines (1) Does the mass properties analysis element (i.e., we and mass measurement ana	ight control, performance,	+ Y - + N -
d.	Training and Education (1) Are the weight control, per measurement analysis tech matrices documented and r	niques, and result	+ Y - + N -
	by the laymen? (2) Have the developed techniq been provided to cognizant review and comment?		+ Y - + N -
e.	Judgments (1) Have management and desi	gn decisions involving	+ Y - + N -

mass properties been based on technical

- assessments (within the purview of cost, schedule, performance, and reliability)?
- (2) Is the time lag from the decision date to actual implementation reasonable (i.e., not greater than two working days)?

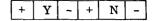


#### f. Technical

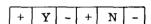
- (1) Have design constraint ground rules and quantitative values been established in sufficient depth to allow specification mass properties criteria to be defined and evaluated?
- + Y + N -
- (2) Have analyses of mass properties uncertainties been accomplished for use in overall system error analyses, to verify nominal values analytically, and to assist in identifying elements of hardware requiring test verification (a positive answer requires tangible evidence of such studies)?



(3) Do the contractor's mass properties assessments provide for the early detection of potential weaknesses and system interface incompatibilities through systematic trend evaluations of system growth and performance changes?



(4) Are the performed assessments (i.e., in reference to established specification, contract end item, and/or scope change quantitative definitions) compatible with the results of NASA technical assessments?



QUALIT	PATIVE EVALUATION NO DATE_	
CENTE	RCONTRACTOR_	
CONTR.	ACT NOSTAGE/MODULE_	
RATING	OFFICIALName and Title	
Classifi	cation: 5. DESIGN MONITORING	
Objectiv	<u>re</u> : To establish the depth and scope of the contractor's mass properties design monitoring activity.	S
a. Pla (1)	(i.e., on a scheduled basis) for mass property	+ Y - + N -
(2)	changes? Are functional system design reviews held on a regular basis?	+ Y - + N -
(3)		+ Y - + N -
b. Cor	nmunications	
	Does the cognizant mass property analyst participate in and/or receive the results of the functional system review?	+ Y - + N -
(2)	Is the cognizant NASA element informed of problems brought to the fore in the review which may compromise established specifications or other contractual	+ Y - + N -
(3)	requirements? Is the mass property control group on automatic and prompt distribution for all indexes, drawings, specifications, changes, and parts lists issued by the contractor's and sub-contractor's engineering and drafting groups?	+ Y - + N -
(4)	and drafting groups?  Does it appear that the mass properties control group is at all times in complete communication with the remainder of the engineering department and drafting groups?	+ Y - + N -
	When the mass property control group does not concu with the drawing, design specification, or change, do they transmit their comments directly to the originati unit, and is subsequent communication documented until a satisfactory resolution of the problem is obtained?	

(2) Is the mass property control group included in the contractor's engineering sign-off procedure? (3) Do all drawings and changes indicate date of review, N the reviewer, and do they include a weight block? (4) Does the mass properties control group monitor all project mass property activities (i.e., technical, administrative, manufacturing, test, and field efforts)? d. Training and Education (1) Are the design monitoring procedures and techniques documented, readily understood, and available to personnel receiving on the job training? (2) Are the aforementioned procedures straightforward, Y N feasible, and a true representation of the mass properties group's design monitoring activity? Judgments (1) Are the reasons advanced by the contractor in justifi-N cation of his mode of design monitoring sound and practical in the overall engineering sense? (2) Will the contractor's method of design monitoring N provide results which will support sound management decisions? f. Technical (1) Are percents of estimated, calculated, and actual N weights an integral part of the mass property control system? (2) Is there an adequate procedure for entering weights Y N into a control log after a specific item of hardware has been released from manufacturing? (3) Is the mass property control group's accounting of N released drawings compatible with the drawing release schedule?

(4) Are standard forms, formats, and analysis procedures

utilized in performing the design monitoring effort (e.g., NASA SP-6004 or equivalent formats)?

Y

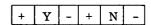
N

QUA	LITATIVE EVALUATION NO	DATE	
CEN	TER	CONTRACTOR	
CON	TRACT NO	STAGE/MODULE	
RAT	ING OFFICIAL	Name and Title	
Clas	sification: 6. SUBCONTRACTO	R AND VENDOR SURVEILLA	NCE
Obje	ctive: To determine the effective mass property control protection the contractor on subcontrol process.	ogram being enforced by	
b.	Planning (1) Does the contractor have a property effect of the contractor mass property effect of the contractor's procure purchase orders and/or specify limiting mass property be met or bettered? (3) Are the subcontractors (i.e. hardware) contractually oblication property control requirement or its equivalent?  Communications (1) Is the contractor's mass profor monitoring subcontractor (2) Is there a clearly defined procompliance with established (3) Do the periodic subcontractor a review of the mass proper	ment specifications, cification drawings clearly rty conditions which must and for major items of signed to follow mass and similar to NASA SP-6004 reperties group responsible rand vendor efforts? recedure for assuring requirements? or design reviews include	+ Y - + N -  + Y - + N -  + Y - + N -  + Y - + N -  + Y - + N -
	Disciplines (1) Does the contractor's mass representative have authorise of the contract) to direct the vendor mass property efform (2) Is the contractor satisfied with mass properties group efform (3) Does the subcontractor meets standards similar to those in item C of classifications	properties group or its ty (i.e., within the limits e subcontractor and t? with the subcontractor's et? t minimum discipline required of the contractor	+ Y - + N - + Y - + N -
d.	Training and Education (1) Does the subcontractor meetraining and education requi		+ Y - + N -

requirements of the contractor in item d. of classifications 2 thru 5, and 7 thru 9?

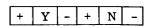
#### e. Judgments

(1) Does the subcontractor meet minimum judgment standards similar to those delineated in item e. of classifications 2 thru 5, and 7 thru 9?



#### f. Technical

(1) Does the subcontractor meet minimum technical standards similar to those delineated in item f. of classifications 2 thru 5, and 7 thru 9?



QUA	ALITATIVE EVALUATION NO	DATE	
CEN	NTER	CONTRACTOR	
CON	TRACT NO	STAGE/MODULE	
RAT	ring Official	Name and Title	
Clas	ssification: 7. MEASURED DATA		
Obje	ective: To establish the adequacy a contractor's mass measure		
a <b>.</b>	Planning (1) Does the contractor have a pla and milestone schedule) mass	, ,	+ Y - + N -
	program?  (2) Does the plan provide for analy requirements for measurement verification (i.e., calibration analyses), for mass measurement subsequent data reduction, and	ts, for facility accuracy and attendant error nent result documentation,	+ Y - + N -
b.	Communication (1) Does the contractor's mass pr have cognizance over all mass the sense of having prepared o ment procedures and ultimatel	measurements (i.e., in or concurred in measure-	+ Y - + N -
	said measurements)? (2) Are the results of said measur NASA as required by NASA SP		+ Y - + N -
c.	Disciplines (1) Are procedures for the mass reincoming equipment and contral hardware strictly enforced? (answer requires a documented includes periodic quality contrals.	actor fabricated An affirmative I procedure which	+ Y - + N -
	(2) Is a NASA representative (at least operation requirements when specification requirements be verified?	east an inspector)	+ Y - + N -
d.	Training and Education (1) Are mass measurements performance (An affirmative and verified by a personnel checker)	nswer should be	+ Y - + N -

record.)

#### e. Judgments

(1) Has the contractor performed studies to support his judgments on which mass properties (including subassemblies equipment and total vehicle) require verification?

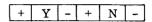
+ Y - + N -

(2) Has the contractor developed, acquired, and maintained mass measurement equipments and/or facilities that are consistent with the precisions, accuracies, and/or tolerances to which he is contractually obligated?

+ Y - + N -

#### f. Technical

(1) Have facility accuracies been verified (i.e., are approved facility error analyses and calibration reports available)?



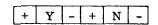
(2) Have all measurement procedures been approved by NASA in accordance with NASA SP-6004 or its equivalent?

+ Y - + N -

QUAI	LITATIVE EVALUATION NO	DATE	
CENT	TER	CONTRACTOR	
CONT	TRACT NO	STAGE/MODULE	
RATI	NG OFFICIAL	Name and Title	
Class	sification: 8. MASS PROPERTIE	S AND PERFORMANCE AS	SURANCE
Objec	etive: To determine if the contra effort to design and fabrics modules to meet or better property requirements.	ate vehicle stages and	
	Planning  1) Does the contractor's mass p provide for the establishment detecting mass property weak become critical? (Refer to c item f. 3.)	of procedures for messes before they	+ Y - + N -
	Communications  1) Are detected anomalies comm project management, cogniza and NASA representatives?	•	+ Y - + N -
	Disciplines  1) Does project management tak effecting trade-off and alterns specific mass properties are probability of exceeding specific	ate design analysis when shown to have a high	+ Y - + N -
	Fraining and Education  1) Has the contractor provided s knowledge of trade-off assess predictive in nature?		+ Y - + N -
	Judgments  1) Have the judgments made to consider assuring the meeting or better and performance requirement (This can be verified by examment records and comparing limit, or specification requirement.	ering of mass property ts been sound and timely? nining actual measure- them to target, control	+ Y - + N -

### f. Technical

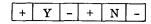
(1) Has the contractor developed and applied analytic procedures and techniques to verify and optimize mass property and performance trade-offs? (An affirmative answer requires tangible evidence in the form of reports.)



QU <i>A</i>	ALITATIVE EVALUATION NO	DATE	
CEN	NTER	CONTRACTOR	
COI	NTRACT NO	_STAGE/MODULE	
RAT	ring official	Name and Title	
Cla	ssification: 9. SUBMITTALS		
<u>Obj</u>	ective: To determine the adequacy and contractor's internal and extended property reporting system.		
a.	Planning (1) Does the contractor's submittal stat of NASA SP-6004 or its equivalent (2) Does the contractor disseminate in accordance with a planned scheet (3) Are reports submitted to NASA on number basis?	valent? internal status reports edule?	+ Y - + N - + Y - + N - + Y - + N -
b.	Communication (1) Are the formats and functional coor its equivalent adhered to by th (2) Are the internal reports furnished design groups of sufficient depth understanding of existing or pred problems? (They should include trends, targets, control limits, a trade-off effects as appropriate.)	e contractor? d to the functional to assure immediate licted mass property current status, and performance	+ Y - + N - + Y - + N -
c.	Disciplines (1) Has the contractor made a concerscheduled submittal dates? (This checking NASA dates of receipts. (2) Is the internal reporting schedule to? (This can be verified by revisible copies of internal reports.)	s can be verified by .) e reasonably adhered	+ Y - + N - + Y - + N -
d.	Training and Education (1) Do the reports submitted to NASA internal reports meet minimum p (Do they reflect an understanding property control and governing re-	professional standards? s of overall mass	+ Y - + N -

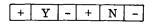
#### e. Judgments

(1) Do the reports submitted to NASA consistently reflect the design base to which they are referenced? (This can be verified by reviewing the contractor's qualifying statements and technical descriptions contained in said reports.)



#### f. Technical

(1) Does the contractor provide detail mass property analyses as required by NASA SP-6004 or its equivalent?



	PROFICIENCY TENGINEERING										II OVERALL OVERALL ADM. PROF.		
	Y DIVIDE IX BYY AND ENTER IN IX	09	09	170	120	061	120	011	09	001	VIII DIVIDE VII BY 990 ENTER IN IX		
FORM	D MUS VI A URHT										*		
RATING FORM	1 TECHNICAL											170	
	• 1NDGMENTS											130	
ENCY	A EDUCATION B											120	
TABLE II PROFICIENCY	C DISCIPLINES											061	:
	P COMMUNICATIONS											<u>6</u>	
	O PLANNING											061	
	OBJECTIVES CLASSIFICATION	I PREPAREDNESS AND ATTITUDES	2 FORMULATION OF REQUIREMENTS	3 FORMULATION OF MASS PROPERTIES CONTROL SYSTEM	4 MASS PROPERTIES ANALYSIS	5 DESIGN MONITORING	6 SUB-CONTRACTOR AND VENDOR SURVEILLANCE	7 MEASURED DATA	8 MASS PROPERTIES AND PERFORMANCE ASSURANCE	9 SUBMITTALS	I SUM I THRU 9	II DIVIDE I BY II AND ENTER IN III	III ADMINISTRATIVE PROFICIENCY

\*SUM OF COL.1V (must equal sum of line 1)

#### TABLE III - FINAL REPORT - SAMPLE OUTLINE

## WEIGHT/PERFORMANCE MANAGEMENT SURVEY FINAL REPORT

		Date
1.	(a) Organization Surveyed:	
	(b) Contract No.:	
	` '	
	(d) Date of Survey:	
2.	CONCLUSIONS:	
		s summarizing results of survey for each of the nine ular emphasis on problem areas.
	(EXAMPLE)	
	by the exceeding of maximudate. Such failure to meet	or Surveillance: A critical problem exists, as evidenced m weight specifications, on 47% of the items delivered to specification requirements involves more than one-third ave weight specifications to meet. Apparent causes are:
	(1) Failure by contractor to the part of subcontractors.	to require Weight/Performance Management Program on
	(2) Failure to exercise det	ailed monitoring of subcontractor design activities.
3.	RECOMMENDATIONS	
		ovement of contractor's Weight/Performance Management or actions to resolve critical problem areas.
	(EXAMPLE)	
		sixty days that adequate Weight/Performance Management posed on all subcontractors.
	(h) Submit within 30 days p subcontractor Weight activi	plans for regular, detailed, quantitative, monitoring of ties.

#### 4. SURVEY DISCUSSION

- (a) General discussion of critical survey results.
- (b) Contractor cooperation in survey.

- (c) Adequacy of contractor preparation for survey.
- (d) Consistency between verbal answers and substantiating evidence.
- (e) Contractor innovations in Weight/Performance Management, and areas of outstanding performance. (These may be applicable to improving the performance of other contractors.)

#### 5. ATTACHMENTS

Detailed results and data to substantiate, clarify, or expand on items covered in the report.